jamp

A Cross-Sectional Study for Determining the Knowledge and Attitudes About Use of Antibiotics in A Rural Area

Seyfi Durmaz[1*], Safiye Özvurmaz[2], Aliye Mandıracıoğlu[1]

[1] Ege University, Medical Faculty, Department of Public Health, Izmir, Turkey
[2] Adnan Menderes University Faculty of Nursing, Aydın, Turkey

Article info	Abstract	Research Article

According to the data of 2015, Turkey ranks first among the OECD countries in infections resistant to antibiotics. The efforts of preventing unprescribed antibiotic use as being implemented in Turkey so far since 2016 may have shaped this relationship. The purpose of the study is to determine knowledge level of the adults living in a rural neighborhood close to Aydın about antibiotics and antibiotic resistance, and their statuses regarding their use. This cross-sectional study was conducted in Aydın. Data were collected from 411 participants. 26 questions were used for the questionnaire. Knowledge-attitude level was determined with average of the number of correct answers given in the survey. Sociodemographic variables and the variables consisting pharmaceutical use variables were defined as independent variable. Linear regression analysis by SPSS 23.0 was for analysis of the data. Simple linear regression outputs were shown as Model 1, and outputs of the multiple linear regression analysis were shown by Model 2. Internal consistency Kuder-Richardson 20 reliability coefficient was calculated. It was determined that self-medication of antibiotics was too low as a result of restriction of unprescribed antibiotic use by the public. It was understood that those using prescribed antibiotics and receiving information from physicians had more knowledge about antibiotics. Having received high school and higher education increased the participants' knowledge-attitude level by 1.88 (1.13-2.64) points, having lived in a city in childhood increased it by 1.07 (0.32-1.82) points, having used antibiotic within the last one month increased it by 1.12 (0.30-1.94) points, and the fact the last used antibiotic is prescribed by doctor increased it by 2.99 (1.17-4.81) points. There may be need for a training program which would generalize the "one health" approach that would provide the opportunity to guide rational antibiotic use in both humans and animals.

INTRODUCTION

The most important one among the consequences of use of wrong, needless, ineffective drugs around the world is development of resistance to antibiotics. Antibiotic resistance is a common public health problem [1].

Another problem is that high pharmaceutical expenditures brings a burden to the social security institutions and the public. In OECD countries, 3% of all pharmaceuticals are antibiotics in average, whereas this ratio is 7.3% in Turkey [2]. In 2015, 38.8% of the infections were infections resistant to antibiotics in OECD countries. Turkey ranks first among OECD countries. Antibiotic resistant infection was reported as 40.6 daily per 1000 people[3]. According to the WHO report, frequency of multiple antibiotic resistance was reported as 30% in 2017[4]. Pharmaceutical costs constitute a substantial part of the healthcare budget in the world. The problems of emergence of resistant microorganisms, increase of morbidity and mortality frequencies, and gradually growing patient care costs, come up following needless and wrong uses of antibiotics[5,6]. According to the report of the Pharmaceutical Industry Employers' Association, the treatment group with the biggest

share on quantity basis among the pharmaceuticals newly introduced to the pharmaceuticals market in Turkey in 2018 was the antibiotics with 22 antibiotics and a share of 10.8% [7].

Infections associated with the antibiotic-resistant pathogens are an important problem all over the world in terms of resulting in death. In the USA, 50 thousand people lost their lives in 2006 due to sepsis and pneumonia that emerged with antibiotic-resistant pathogens[1].

The primary reason of needless and improper antibiotic use is the fact that what antibiotics are is not known or that they are known wrong[8]. Infrastructure of the healthcare system, difficulties involving access to the healthcare institutions, absence of health insurance, lack of sufficient arrangements regarding the pharmaceuticals, difficulty in accessing the pharmaceutical, possibility to access the antibiotic outside the pharmacy, patient-physician communication, approaches concerning the diseases, habits in the public such as pharmaceutical sharing and stocking of the pharmaceuticals at home, public culture, socioeconomic status, insufficient knowledge about the subject matter, are the factors influencing needless antibiotic use [9–11].

Unprescribed antibiotic use is not the problem of only

developing countries. In developed countries, the problem could not have been solved due to online sale and access from stores selling unprescribed pharmaceuticals[12].

According to the report "Rational Antibiotic Use by the Public" of the study conducted by the Ministry of Health in 2010 in 12 provinces, antibiotics rank in the third place after the analgesics and antihypertensives in the requests for prescription of pharmaceuticals. It was determined that 24.3% of those visiting FHCs for the purpose of having pharmaceuticals prescribed and 31.3% of those applying to state hospitals requested pharmaceuticals of antibiotic group. 8.7% of the patients applying to FHCs and 7.1% of the patients applying to state hospitals reported that antibiotics treated every disease. Half of the patients applying to FHCs and more than half (55.7%) of the patients applying to state hospitals were understood to have pharmaceuticals (analgesics, antiflues and antibiotics) at home which they do not use, which are leftover or which they keep as spare[13].

The "One Health" concept summarised is a approach to achieve optimal health outcomes recognizing the interconnections between people, animals, plants and their shared environment. Antimicrobial resistance requires a holistic and multisectoral approach which is referred to as One Health. Because antimicrobials used to treat various infectious diseases in animals or for humans. Resistant bacteria arising in animals or humans may spread from one to the other[14].

The Ministry of Health has been conducting studies for many years in regard to rational use pharmaceuticals. Most recently, arrangements concerning use of antibiotics have come to the foreground. It is important to determine how much the public is aware of this matter following the practice of discontinuing buying of unprescribed antibiotics from the pharmacies, which has been ongoing since 2016. Following this practice, determination of frequency of unprescribed antibiotic use and what is known wrong will guide the new measures to be taken in this regard. The purpose of the study is to determine knowledge level of the individuals older than 18 years, who are living in a rural neighborhood close to Aydın, about antibiotics and antibiotic resistance, and their statuses regarding their use of antibiotics.

MATERIALS and METHODS

This cross-sectional study was conducted at Çeştepe Family Health Center (FHC) located in a rural neighborhood (Tepecik) close to Aydın.

The population recorded for the two physicians present at the FHC was reported as 6400, and the number of the individuals older than 18 years was reported as 1600. The sample calculation performed with the Epi Infor 6.0 program revealed - with 95% confidence interval, 50% prevalence, 5% error margin - the necessity to include minimum 310 individuals (as random sample) in the study. Between October 2018 and April 2019, 450 participants applying to the FHC were reached, and 411 participants accepted to answer the survey questions. 39 individuals who were not willing to answer the questionnaire were not included in the study.

A questionnaire was used consisting of such questions which will determine demographic characteristics of the participants, and their knowledge and attitudes about use of antibiotics. The questionnaire consisted of 26 questions[5,9,10,11,12,15]. Adult individuals older than 18 years, who accepted to participate in the study, filled in the questionnaire through self-report method. The knowledge-attitude level about use of antibiotics, which consists of evaluation of the answers given by them to the survey, constituted the dependent variable in the study. Evaluation was made based on the average of the number of correct answers. Gender, age, educational level, settlement lived in childhood, when antibiotic was used last, whether the last used antibiotic was prescribed by doctor, whether received information from the doctor or pharmacist about the last used antibiotic were defined as the independent variables.

Data were analyzed on SPSS 23.0 statistical packet program. Descriptive statistics and linear regression analysis were used in analysis of the data. Simple linear regression was used in evaluation of the knowledge-attitude levels about use of antibiotics with each variable, and the outputs were exhibited as Model 1. Outputs of the multiple linear regression analysis including all the variables together are shown by Model 2. Internal consistency Kuder-Richardson 20 (KR-20) reliability coefficient was calculated so as to determine reliability of the 18-question test consisting of statements.

Prior to conducting the study, ethical approval dated 31.01.2019 and no. 19.11T/7 was obtained from Ege University Faculty of Medicine.

RESULTS

411 individuals participated in the study. 55.0% of the participants were female and mean age was 39.3 ± 14.3. 61.0% had

secondary and lower education, and 35.9% lived in village (Table 1).

Table 1: Identifying characteristics of the participants

Category (N)	Level	Number (n)	Percentage (%)
Gender (409)	Female	225	55.0
	Male	184	45.0
Age (407)	Below 40 years	223	54.8
	40 years and above	184	45.2
Education (410)	Illiterate	24	5.9
	Elementary school	139	33.9
	Secondary school	87	21.2
	High school	110	26.8
	University	50	12.2
Settlement lived in childhood (407)	Province	165	40.5
	County	96	23.6
	Village	146	35.9

16.2% of the participants expressed that they used antibiotics within the last one month, 64.8% within the last one year, and 2.5% expressed that they never used. Ratio of the participants whose last antibiotic was prescribed by a doctor was 96.7%, and 3.3% expressed that they self-medicated antibiotics. When examined the factors affecting use of prescribed antibiotics, it was found that age, gender and the settlement lived in childhood were irrelated. Those with low educational level were found to self-medicate more (chi-square=7.07, p=0.008). 94.2% of the participants stated that they received information from the doctor or pharmacist about the antibiotics. When asked the individuals participating in the study in which cases they used antibiotic; 1% reported as HIV, 11.7% as diarrhea, 20% as fever, 0.5% as malaria, 51.3% as urinary tract infection, 7.3% as skin infection, and 7.5% as headache.

KR-20 coefficient of this test consisting of 18 statements was found as 0.775. Average of the correct answers by the participants to the statements was 9.3 ± 3.8, and median was 10. 208 individuals checked more than half of the statements correctly (Table 3).

The three statements with the highest correct answer ratio are as follows in order:

1. Doctors should prescribe antibiotics only when necessary (388 participants, 94.6%).

2. Antibiotics should be used only when prescribed by the doctor (382 participants, 94.1%).

3. We can use an antibiotic received from a friend or relative as long as it treats the same disease. (365 participants, 89.0%).

The three statements with the lowest correct answer ratio are as follows:

1. I don't have risk of acquiring an antibiotic-resistant infection as long as I use my antibiotics correctly (20 participants, 4.9%).

2. Antibiotic resistance is a problem which may affect only the individuals using antibiotics regularly (48 participants, 11.8%).

3. A small amount of antibiotics should be given to farm animals (bred for consumption) (58 participants, 14.2%).

Evaluation of answers of the participants concerning all statements is shown in Table 3.

The participants' age, education, settlement lived in childhood, whether they used antibiotic within the last one month, whether the last used antibiotic was prescribed by doctor, were found to be related with their knowledge-attitude levels about use of antibiotics (p<0.05). In the advanced analysis conducted, age was found not to have any relation with the knowledge-attitude level about use of antibiotics (p=0.267). Having received high school and higher education increased the knowledge-attitude level by 1.88 points, having lived in a city in childhood increased it by 1.07 points, having used antibiotic within the last one month increased it by 1.12 points, and the fact the last used antibiotic is prescribed by doctor increased it by 2.99 points (Table 4).

Table 2. Distribution of the answers given by the participants to the questions on their last use of antibiotics

Category (N)	Level	Number (n)	Percentage (%)
When did you last use antibiotics? (408)	Within the last 1 month	66	16.2
	Within the last 6 months	174	42.7
	Within the last 1 year	264	64.8
	Earlier than 1 year	77	18.9
	I never used	10	2.5
	I don't remember	57	14.0
Was your last antibiotic prescribed by a doctor? (390)	Yes	375	96.2
	No	15	3.8
Did you receive information from the doctor or pharmacist about how you should use when you last used antibiotic? (396)	Yes	373	94.2
	No	23	5.8

Table 3. Distribution of the correct answers given by the participants to the statements presented about antibiotic use

Statements	Total Number (N)	Correct answerers Number (n)	Correct answerers Percentage (%)
Antibiotics should be used only when prescribed by the doctor.	406	382	94
A small amount of antibiotics should be given to farm animals (bred for consumption).	409	58	14.2
Leftover antibiotics should be not kept and should not be used for subsequent diseases.	410	73	18.0
Doctors should prescribe antibiotics only when necessary.	410	388	95.0
Antibiotic resistance is one of greatest problems encountered by the world.	410	264	64.0
Everyone should take responsibility for correct antibiotic use.	409	339	83.0
Antibiotic resistance may affect the health of mine and my family.	409	286	70.0
I don't have risk of acquiring an antibiotic-resistant infection as long as I use my antibiotics correctly.	409	20	4.9
Antibiotic resistance occurs due to your body's becoming more resistant to the antibiotic and inability of the antibiotics to fulfill their functions any more.	408	209	51.0
Many infections are becoming gradually more resistant to antibiotic treatment.	409	229	56.0
If some bacteria is resistant to the antibiotics, it is virtually impossible to treat the infections caused by those bacteria.	408	197	48.0
Antibiotic resistance is the problem of the countries other than my country.	409	70	17.0
Antibiotic resistance is a problem which may affect only the individuals using antibiotics regularly.	408	48	11.8
Antibiotic-resistant bacteria can spread from person to person.	409	184	45.0
Antibiotic-resistant infections make the health applications like surgery, organ transplantation and cancer treatment much more dangerous.	409	172	42.0
I think once I start antibiotic treatment I have to discontinue taking antibiotics when I finish all antibiotics (the dose).	402	267	66.0
We can use an antibiotic received from a friend or relative as long as it treats the same disease.	408	365	89.0
It is right to buy or ask your doctor to prescribe the antibiotic which you have used for the same complaints previously and which helped you to heal.	410	276	67.0

Table 4. Comparison of knowledge-attitude level of participants about use of antibiotics and several factors

Variables	MODEL 1 AVR	95% CI min	95% CI max	p	MODEL 2* AVR	95% CI Min	95% CI Max	p
Age	-0.05	-0.08	-0.03	0.000	-.015	-.040	.011	0.267
Gender	0.26	-0.40	0.93	0.434	.391	-.237	1.019	0.222
Education**	2.55	1.92	3.17	0.000	1.882	1.128	2.637	0.000
Settlement lived in childhood	2.13	1.48	2.79	0.000	1.067	0.320	1.815	0.005
Last one month	1.00	0.18	1.89	0.027	1.120	0.302	1.938	0.007
Prescribed by doctor	2.93	1.21	4.65	0.001	2.991	1.170	4.813	0.001
Information from doctor or pharmacist	1.27	-0.16	2.69	0.081	0.227	-1.130	1.583	0.742

Descriptiveness of the variables in the table for antibiotic use knowledge-attitude level in multiple regression is 20%.

**Education was included in the analysis in two categories as 'secondary school and lower' and 'high school and higher'.*

DISCUSSION

This study evaluated the use of antibiotics by the public as well as their knowledge about this subject. In the study, it was understood that antibiotic use within the last month was approximately 16.0% and that unprescribed antibiotic use was 3.8%. In the study conducted in our country by İlhan et al., it was shown that 54.1% of the patients applying to primary healthcare centers self-medicated antibiotics[14]. In the study conducted in Sivas by Şantaş and Demirgil, use of unprescribed antibiotics by the participants was stated

to be 27.4%[15]. Due the fact that our study was conducted 3 years after restriction of unprescribed antibiotic use, a very lower unprescribed antibiotic use was found compared to studies conducted previously in our country. It was reported in the literature that self-medication of antibiotics was 27.5% in Kuwait, 44.0% in Abu Dhabi, 44.6% in Greece, 40.0% in Vietnam[11-14]. In a study conducted, unprescribed antibiotic use was found as 55.1% in Yemen, 45.0% in Uzbekistan[16], and 75.7% in Uganda[17]. In a study conducted through telephone conversation in 9 countries (Turkey, France, England, Thailand, Morocco, Columbia, Spain, Belgium, Italy), 32% of the participants reported that they took the pharmaceuticals directly from pharmacy without prescription[18].

It is reported that sociodemographic characteristics are related with unprescribed antibiotic use. The relationship with educational level was determined in the study. In the literature, while there are studies in which more self-medication of antibiotics was found among the individuals with high educational level[14,19], publications are also available which report more frequent unprescribed use among those with low education, similarly to our study[20].

Part of the study participants, albeit few, think that antibiotics are used for problems such as headache, HIV, etc. In the literature, it was determined that it was thought that antibiotics may be used in viral infections, cough, fever and many more complaints[21–23].

In this study conducted in Aydın, it was understood that the participants had insufficient knowledge on several matters regarding antibiotics. In many studies, it was stated that there was a serious lack of knowledge about use of the antibiotics[8,24]. This also includes lack of knowledge about use of antibiotics in animals. In a study conducted in China, it was expressed that about one third of pig breeding farms stocked antibiotics for animals[25].

According to multiple analysis result, the antibiotic knowledge statuses were found to be related with the sociodemographic variables such as age, education, region lived in childhood. Other studies support this result, as well[20,26].

As expected in the study, knowledge level of those receiving information from doctor and pharmacist, using prescribed antibiotics, was found to be better. Similar results are highlighted in the studies[26]. In the meta-analysis conducted by Gualano et al., informing of the patients by the physicians, antibiotic awareness studies, were very effective in increase of the antibiotic knowledge level of the societies, hence, in correct antibiotic use[27].

Limitations of this study are the fact that its cross-sectional design results in not explaining the causality completely. Moreover, the answers given to the surveys are assumed to be correct, and limitations depending on recollection may emerge. The results obtained can represent only the place where the study was conducted, they may not be expanded to the whole city.

In conclusion, this study conducted in a rural area in Aydın determined that self-medication of antibiotics was too low as a result of restriction of unprescribed antibiotic use by the public. It was understood that those using prescribed antibiotics and receiving information from physicians had more knowledge about antibiotics. Trainings increasing antibiotic awareness and legal arrangements preventing wrong use prove to be effective in our country. Furthermore, there is need for a training program which would generalize the "one health" approach that would provide the opportunity to guide rational antibiotic use in both humans and animals.

Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Rather IA, Kim B-C, Bajpai VK, Park Y-H. Self-medication and antibiotic resistance: Crisis, current challenges, and prevention. *Saudi J. Biol. Sci.* 2017;24:4:808–812.

2. Cecchini M, Lee S. Low-value health care with high stakes: Promoting the rational use of antimicrobials. In: Tackling Wasteful Spending on Health. OECD Publishing Paris: OECD; 2017. p. 115–158.; 2017.

3. Organisation for Economic Co-operation and Development . Stemming the Superbug Tide. Paris: OECD Health Policy Studies; 2018.

4. World Health Organization. Central Asian and Eastern European Surveillance of Antimicrobial Resistance. Copenhagen; 2017.

5. André M, Vernby Å, Berg J, Lundborg CS. A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden. *J Antimicrob Chemother.* 2010;65:6:1292–1296.

6. Samore MH, Bateman K, Alder SC, Hannah E, Donnelly S, Stoddard GJ, et al. Clinical Decision Support and Appropriateness of Antimicrobial Prescribing. *JAMA*. 2005;294:18:2305.

7. Pharmaceutical Industry Employers Union. Pharmaceutical Market in January-June 2018. Istanbul Turkey; 2018.

8. Larson EL, Dilone J, Garcia M, Smolowitz J. Factors Which Influence Latino Community Members to Self-Prescribe Antibiotics. *Nurs Res*. 2006 Mar;55:2::94–102.

9. Deschepper R, Grigoryan L, Lundborg CS, Hofstede G, Cohen J, Kelen G Van Der, et al. Are cultural dimensions relevant for explaining cross-national differences in antibiotic use in Europe? *BMC Health Serv Res*. 2008;8:123.

10. Widayati A, Suryawati S, de Crespigny C, Hiller JE. Self medication with antibiotics in Yogyakarta City Indonesia: a cross sectional population-based survey. *BMC Res Notes*. 2011;4:491.

11. Ab Halim NAA, Chang C-T, Chan HK, Hassali MA, Nouri A. Knowledge and Attitudes Concerning Antibiotic Use and Resistance among the Public in Pulau Pinang, Malaysia. *Malaysian J Med Sci*. 2018;25:6::141–7.

12. Abdel Gawad Elmasry A, Samir Mohamed Bakr A, Alaaeldin Abdou Abdelaziz Kolkailah D, Almohamady Ibrahim Khaskia M, Essam Eldin Mohammed M, Hatem Mohamed Amin Riad O, et al. Pattern of antibiotic abuse – a population based study in Cairo. *Egypt J Chest Dis Tuberc*. 2013;62:1:189–195.

13. Turkish Ministry of Health. Community's Perspective on Rational Drug Use. Akdag R, Editor. Ankara: Yorum Printing; 2011.

14. Collignon P. The importance of a one health approach to preventing the development and spread of antibiotic resistance. *Curr Top Microbiol Immunol*. 2013;366:19–36.

15. Ilhan MN, Durukan E, Ilhan SÃ, Aksakal FN, Ãzkan S, Bumin MA. Self-medication with antibiotics: questionnaire survey among primary care center attendants. *Pharmacoepidemiol Drug Saf*. 2009;18(12):1150–1157.

16. Şantaş F, Demirgil B. A Research on Rational Drug Use. *Business Science Journal*. 2017 Apr 30; 5:1: 35

17. Belkina T, Al Warafi A, Hussein Eltom E, Tadjieva N, Kubena A, Vlcek J. Antibiotic use and knowledge in the community of Yemen, Saudi Arabia, and Uzbekistan. *J Infect Dev Ctries*. 2014;8:4:424–429.

18. Ocan M, Bwanga F, Bbosa GS, Bagenda D, Waako P, Ogwal-Okeng J, et al. Patterns and Predictors of Self-Medication in Northern Uganda. Carvajal A, editor. *PLoS One*. 2014;9:3:e92323.

19. Pechère JC. Patients' Interviews and Misuse of Antibiotics. *Clin Infect Dis*. 2001;33:3:170–173.

20. Oztora S, Nepesova G, Caylan A, Dagdeviren HN. The practice of self-medication in an urban population. *Biomedical Research* (India). 2017; 28:6160-6164.

21. Jamhour A, El-Kheir A, Salameh P, Hanna PA, Mansour H. Antibiotic knowledge and self-medication practices in a developing country: A cross-sectional study. *Am J Infect Control*. 2017;45:4:384–388.

22. Grigoryan L, Burgerhof JGM, Degener JE, Deschepper R, Lundborg CS, Monnet DL, et al. Attitudes, beliefs and knowledge concerning antibiotic use and self-medication: a comparative European study. *Pharmacoepidemiol Drug Saf*. 2007;16:11:1234–1243.

23. Awad AI, Eltayeb IB. Self-Medication Practices with Antibiotics and Antimalarials Among Sudanese Undergraduate University Students. *Ann Pharmacother*. 2007;41:7–8:1249–1255.

24. Pavydė E, Veikutis V, Mačiulienė A, Mačiulis V, Petrikonis K, Stankevičius E. Public Knowledge, Beliefs and Behavior on Antibiotic Use and Self-Medication in Lithuania. *Int J Environ Res Public Health*. 2015;12:6:7002–7016.

25. Mitsi G, Jelastopulu E, Basiaris H, Skoutelis A, Gogos C. Patterns of antibiotic use among adults and parents in the community: A questionnaire-based survey in a Greek urban population. *Int J Antimicrob Agents*. 2005;25:5:439–443.

26. Dyar OJ, Yin J, Ding L, Wikander K, Zhang T, Sun C, et al. Antibiotic use in people and pigs: a One Health survey of rural residents' knowledge, attitudes and practices in Shandong province, China. *J Antimicrob Chemother*. 2018;73:10:2893–2899.

27. Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF. Public Knowledge, Attitudes, and Experience Regarding the Use of Antibiotics in Italy. Cloeckaert A, editor. *PLoS One*. 2013;8:12:e84177.

28. Gualano MR, Gili R, Scaioli G, Bert F, Siliquini R. General population's knowledge and attitudes about antibiotics: a systematic review and meta-analysis. *Pharmacoepidemiol Drug Saf*. 2015;24:1:2–10.